

WE CLAIM:

1. A process for recovery of thermal energy from an offgas stream said process comprising the following steps:
 - 5 a) oxidizing an aromatic feedstock with a liquid phase reaction mixture in a reaction zone to form an aromatic carboxylic acid-rich stream and a gaseous mixture;
 - b) removing in a separation zone a substantial portion of a solvent from said gaseous mixture to form said offgas stream and a solvent rich
10 stream; and
 - c) recovering said thermal energy from at least a portion of said offgas stream in a heat recovery zone; wherein a portion of said offgas stream is condensed to form a condensed mixture; wherein said condensed mixture is optionally recycled back to said separation zone; wherein a
15 portion of said thermal energy is recovered in a working fluid; wherein a portion of the enthalpy in said working fluid is recovered in a power cycle; and wherein said working fluid is a compound or mixture of compounds that have a normal boiling point between about -100°C to about 90°C .
2. A process according to claim 1 wherein a portion of said thermal
20 energy from said offgas stream is used to produce steam.
3. A process according to claim 1 wherein said working fluid is selected from the group consisting of propane, isopropane, isobutane, butane, isopentane, n-pentane, ammonia, R134a, R11, R12, and mixtures thereof.

4. A process according to claim 2 wherein said working fluid is selected from the group consisting of propane, isopropane, isobutane, butane, isopentane, n-pentane, ammonia, R134a, R11, R12, and mixtures thereof.
5. A process according to claim 4 wherein said separation zone
5 comprises a distillation column.
6. A process according to claim 5 where said distillation column is operated at a temperature of about 130 °C to about 220 °C.
7. A process according to claim 6 wherein said distillation column is operated at a pressure of about 3.5 barg to about 15 barg.
- 10 8. A process according to claim 1 wherein said power cycle is an organic rankine cycle or a kallina cycle.
9. A process for recovery of thermal energy from an offgas stream said process comprising the following steps:
 - a) removing in a separation zone a substantial portion of a solvent
15 from a gaseous mixture to form said offgas stream and a solvent rich stream; and
 - b) optionally, recovering thermal energy from a portion of said offgas stream in a first heat recovery zone to produce a low pressure steam.
 - c) recovering thermal energy from a portion of said offgas stream in
20 a second heat recovery zone utilizing a working fluid; wherein a portion of the enthalpy in said working fluid is recovered in a power cycle; wherein said working fluid is a compound or mixture of compounds that have a normal boiling point between about -100 °C to about 90° C; and

d) optionally, recovering thermal energy from a portion of said offgas stream in a third heat recovery zone.

10. A process according to claim 9 wherein said power cycle is an
5 organic rankine cycle or a kallina cycle.

11. A process according to claim 9 wherein said working fluid is selected from the group consisting of propane, isopropane, isobutane, butane, isopentane, n-pentane, ammonia, R134a, R11, R12, and mixtures thereof.

12. A process according to claim 9 wherein said working fluid is a
10 compound or mixture of compounds that have a normal boiling point between about -100°C to about 60°C

13. A process according to claim 1 wherein said first heat recovery zone comprises a heat recovery device operated at a temperature of about -100°C to about 60°C .

15 14. A process according to claim 13 wherein said second heat recovery zone comprises a heat recovery device operated at a temperature between about 80°C to about 120°C .

15. A process according to claim 14 wherein said third heat recovery zone comprises a heat recovery device operated at a temperature between
20 about 20°C to about 100°C .

16. A process according to claim 15 wherein said first heat recovery zone comprises a partial condenser.

17. A process according to claim 16 wherein said second heat recovery zone comprises a heat recovery device selected from the group consisting of a condenser and a partial condenser.

18. A process according to claim 17 wherein said third heat recovery zone comprises a heat recovery device selected from the group consisting of a water cooler and an air cooler.

19. A process for recovery of thermal energy from an offgas stream said process comprising the following steps:

a) oxidizing an aromatic feedstock with a liquid phase reaction mixture in a reaction zone to form an aromatic carboxylic acid stream and a gaseous mixture;

b) removing in a separation zone a substantial portion of a solvent from said gaseous mixture to form said offgas stream and a solvent rich stream; and

c) optionally, recovering thermal energy from a portion of said offgas stream in a first heat recovery zone to produce a low pressure steam;

d) recovering thermal energy from a portion of said offgas stream in a second heat recovery zone using a working fluid in a power cycle; wherein said working fluid is a compound or mixture of compounds that have a normal boiling point between about -100°C to about 90°C ;

e) optionally, recovering thermal energy from a portion of said offgas stream in a third heat recovery zone.

20. A process according to claim 19 wherein said first heat recovery zone comprises a heat recovery device operated at a temperature of about 100 °C to about 160 °C.
21. A process according to claim 20 wherein said second heat recovery zone comprises a heat recovery device operated at a temperature between about 80 °C to about 120 °C.
22. A process according to claim 21 wherein said third heat recovery zone comprises a heat recovery device operated at a temperature between about 20 °C to about 100 °C.
23. A process according to claim 22 wherein said first heat recovery zone comprises a partial condenser.
24. A process according to claim 23 wherein said second heat recovery zone comprises a heat recovery device selected from the group consisting of a condenser and a partial condenser.
25. A process according to claim 24 wherein said third heat recovery zone comprises a heat recovery device selected from the group consisting of a water cooler and an air cooler.
26. A process according to claim 19 wherein said power cycle is an organic rankine cycle or a kallina cycle.
27. A process for recovery of thermal energy from an offgas stream said process comprising the following steps in the order named:

a) oxidizing an aromatic feedstock with a liquid phase reaction mixture in a reaction zone to form an aromatic carboxylic acid stream and a gaseous mixture;

b) removing in a separation zone a substantial portion of a solvent
5 from said gaseous mixture to form said offgas stream and a solvent rich stream; and

c) recovering thermal energy from a portion of said offgas stream in a first heat recovery zone to produce a low pressure steam;

d) recovering thermal energy from a portion of said offgas stream in
10 a second heat recovery zone using a working fluid in a power cycle; wherein said working fluid is a compound or mixture of compounds that have a normal boiling point between about -100°C to about 90°C ; and

e) recovering thermal energy from a portion of said offgas stream in a third heat recovery zone.

15 28. A process according to claim 27 wherein said first heat recovery zone comprises a heat recovery device operated at a temperature of about 100°C to about 160°C .

29. A process according to claim 28 wherein said second heat recovery zone comprises a heat recovery device operated at a temperature between
20 about 80°C to about 120°C .

30. A process according to claim 29 wherein said third heat recovery zone comprises a heat recovery device operated at a temperature between about 20°C to about 100°C .

31. A process according to claim 30 wherein said first heat recovery zone comprises a partial condenser.

32. A process according to claim 31 wherein said second heat zone comprises a heat recovery device is selected from the group consisting of a
5 condenser and a partial condenser.

33. A process according to claim 32 wherein said third heat recovery zone comprises a heat recovery device is selected from the group consisting of a water cooler and an air cooler.

34. A process according to claim 27 wherein said power cycle is an
10 organic rankine cycle or a kallina cycle.